nations involved in ordinary Mendelian phenomena; that the mutative changes concern various characteristics of the plant, but that the factor for each new type is regularly inherited as a unit, sometimes showing linkage with another factor pair, so that we may suppose, in some cases at least, that the essential change is limited to a portion of one chromosome. The very first test of these conclusions would demand that the mutations reproduce the mutational type in 75 per cent of their progeny in the first generation, and that 25 per cent of the progeny be homozygous dominants. This condition apparently is satisfied in the case of only 1 mutation of the 8, and until the data appear we have no basis for an independent judgment as to whether the progenies of the second generation were large enough to prove the point at issue. Except from this one mutation, no homozygous mutational type has segregated from any of the supposed heterozygous dominants. In the mind of one who is familiar with the group of the evening primroses a suspicion naturally arises that FROST's mutations are not Mendelian at all, but that they show the type of behavior familiar in *Oenothera lata* DeVries, and recently discovered in mutations from *O. stenomeres* and *O. pratincola*. These mutations always give progenies consisting of a mixture of the parental and mutational types. In the case of *O. lata* the cytological explanation is now so well known as hardly to require comment; it certainly suggests that a cytological examination of the *Matthiola* mutations would not be amiss. Reciprocal crosses between the mutational and parental types might also throw light on the possible analogy between the evening primroses and stocks, for in such types as *Oenothera lata* mutational characters are carried only by part of the female gametes, and by none of the male gametes. All that FROST tells about the *Matthiola* mutations so exactly parallels what is found in *Oenothera* that one can hardly refrain from suggesting, in the absence of data supporting his own interpretation, that instead of discovering new Mendelian dominants he has found in a widely distant group some of the perplexing phenomena which critics of the mutation theory persist in regarding as peculiar to *Oenothera*. More and more facts are coming to light in groups other than *Oenothera* which do not fall into line according to Mendelian expectations. As an example of what looks like mutation in the DeVriesian sense, one thinks of the rogues of peas, investigated by BATESON; as an example of matroclinic, non-segregating hybrids, quite comparable to those of *Oenothera*, we have the cases in *Primula*, recently reported by PELLEW and DURHAM. If the type of heredity shown by *Oenothera lata* were found to apply to the mutations of *Matthiola*, it would be almost as interesting as the discovery of new Mendelian dominants.—H. H. BARTLETT.

Respiration in succulents.—That succulent plants exhibit peculiarities in their respiratory processes and periodic changes in acidity with light and darkness has been known for a long time. RICHARDS[3] has investigated these

[3] RICHARDS, HERBERT M., Acidity and gas interchange in cacti. Carnegie Inst., Washington, Publication no. 209. pp. 107. 1915.

periodic acidity changes and the respiratory ratios in cacti, a group heretofore not sufficiently studied. Extensive work has been done, principally with *Opuntia versicolor*, with results in general agreement with what is already known regarding respiration in succulents. The paper presents a large mass of data, and considers the influence of light, temperature, oxygen supply, and wounding on the acidity of the tissues, and devotes considerable space to the relation of acidity, light, temperature, oxygen, etc., to the rate and ratio of gas interchanges. The production of the acid, chiefly malic acid in cacti, is thought to be due to lack of oxygen in the tissues, owing to anatomical structures which, to restrict transpiration, restrict the other gas exchanges as well. During the night the acid accumulates, because the chief factors capable of causing deacidification, namely, light, high temperature, prolonged darkness, and unusually high oxygen pressures, are absent.

The true respiratory quotient for cacti is low, and can be measured accurately only when acidity is stationary or rising. For during falling acidity, the approach of the ratio to the typical ratio, unity, is not real, because the increased CO_2 is furnished merely by the decomposition of the acid, which is not considered a respiratory process. Some of the minor points brought out are that while CO_2 production closely parallels rise and fall of temperature, it lags behind by about an hour, maximum and minimum CO_2 production being reached about an hour later than maximum and minimum temperature; and that total acidity increases more rapidly than the acid concentration of the juice. This is reasonably traced to greater hydration of the colloids in the presence of the acids, and to an increased osmotic pressure in the cell sap leading to greater turgidity.

The main point of interest to physiologists is the interpretation of the phenomena, which differs somewhat from that of NATHANSOHN, who looked upon the breaking down of the acids by day as a completion of the respiratory process at a time when CO_2 could be used in photosynthesis. This view makes the CO_2 production during deacidification a source of respiratory energy, and at the same time of great biological significance in conserving the raw materials for photosynthesis. RICHARDS considers the acid the end product of respiration rather than an intermediate product. The breaking down of the acid by day is due chiefly to light, aided by the accompanying high temperature. The reaction is photolytic and not respiratory, probably takes place in the cell sap, and therefore probably yields its energy not in connection with the living protoplasm. He points out that CO_2 production during deacidification may be so rapid as to exceed photosynthetic use of the gas, and states that "whatever of energy there may be from the final oxidation of the acid outside the sphere of protoplasmic activity is simply the result of anatomical peculiarities of the plant, the advantages of which may well outweigh this loss."

The whole problem of acidity and gas exchange under life conditions is necessarily a very complex one because so many variable factors are involved, and a careful reading of the paper emphasizes this fact. Conclusions must therefore be drawn with considerable care.—CHARLES A. SHULL.

Insects and plant diseases.—Although both botanists and entomologists have realized for a long time that insects are carriers of organisms of plant diseases, very little attention has been given to the study of the subject. However, there is now a tendency to take up this line of investigation. Four papers have come to the reviewer's desk recently.

A paper by RAND[4] on the dissemination of the bacterial wilt of cucurbits follows out a suggestion given by ERWIN F. SMITH and produces evidence indicating that this leaf-eating cucumber beetle (*Diabrotica vittata*) is both the summer and the winter carrier of the *Bacillus tracheiplilus* which causes the wilt of cucumbers and other cucurbits.

In a later paper by RAND and ENLOWS,[5] the authors not only confirm the conclusions given by RAND in the first paper, but also include the 12-spotted cucumber beetle (*D. duodecimpunctata*) as an important summer carrier of this organism. In experiments by the same authors, the squash bug (*Anasa tristis*), the flea beetle (*Crepidodera cucumeris*), the melon aphis (*Aphis gossypii*), and the 12-spotted lady beetle (*Epilachna borealis*) did not transmit the disease.

Another paper by HYSLOP[6] on *Triphleps insidiosus* and corn rots gives conclusive evidence that this insect is the carrier of the fungi causing ear rots. In view of the fact that this insect has been considered beneficial since about 1881, HYSLOP's studies are of more than ordinary interest.

A fourth paper by STEWART and LEONARD[7] records their results with a number of experiments and comes to the conclusion "that all of the sucking bugs found in the nursery are of more or less importance in producing fire blight infections and must be considered *tout ensemble*. The relative importance of each species is difficult to determine. By virtue of their method of feeding and prevalence during each season, certain species are undoubtedly more destructive than others. On the other hand, under special conditions when a certain species is found in large numbers it may become of considerable importance. Usually the tarnished plant bug is more injurious than the leaf-hopper from the fact that the greater percentage of leaf-hopper punctures occur in the leaf tissue."—MEL T. COOK.

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[4] RAND, F. V., Dissemination of bacterial wilt of cucurbits. Jour. Agric. Research **5**:257–260. 1915.

[5] RAND, F. V., and ENLOWS, ELLA, M., Transmission and control of bacterial wilts of cucurbits. Jour. Agric. Research **6**:417–434. 1916.

[6] HYSLOP, J. A., *Triphleps insidiosus* as the probable transmitter of corn ear rot (*Diplodia* sp. *Fusarium*). Jour. Econ. Entomology **9**:435–437. 1916.

[7] STEWART, V. B., and LEONARD, M. D., Further studies on the rôle of insects in the dissemination of fire blight bacteria. Phytopath. **6**:152–158. 1916.